

CLAIMS

What is claimed is:

1 1. A process of forming a metallization comprising:
2 forming a first interlayer dielectric (ILD) layer above a substrate;
3 forming a first recess in the first ILD layer;
4 filling the first recess with a first interconnect;
5 forming a conductive first diffusion barrier layer above and on the first interconnect;
6 forming an upper ILD layer above the first conductive diffusion barrier layer;
7 forming an upper recess in the upper ILD layer to optionally expose the first
8 conductive diffusion barrier layer;
9 forming an upper interconnect in the upper recess; and
10 forming a conductive upper diffusion barrier layer above and on the upper
11 interconnect.

1 2. The process according to claim 1, wherein at least one of forming a conductive first
2 diffusion barrier layer and forming a conductive upper diffusion barrier layer includes:
3 electroless plating the conductive diffusion barrier layer.

1 3. The process according to claim 1, wherein at least one of forming a conductive first
2 diffusion barrier layer and forming a conductive upper diffusion barrier layer includes:

vapor depositing the conductive diffusion barrier layer, selected from chemical vapor deposition, plasma-enhanced chemical vapor deposition, atomic layer chemical vapor deposition, and physical vapor deposition.

4. The process according to claim 1, further including:
forming a barrier film in at least one of the first recess and the upper recess; and
optionally forming a conductive seed film over the barrier film.

5. The process according to claim 1, further including:
forming a barrier film in at least one of the first recess and the upper recess;
forming a conductive diffusion barrier film over at least one of the barrier film;
and
optionally forming a conductive seed film over the conductive diffusion barrier film.

6. The process according to claim 1, wherein forming a first ILD layer includes forming an organic ILD layer, further including:
forming a hard mask above and on the organic ILD layer; and
patterning an opening in the hard mask.

7. The process according to claim 1, further including:
forming a first hard mask above and on the first ILD layer;
patterning an opening in the first hard mask;

4 forming an upper hard mask above and on the upper ILD layer;
5 patterning an opening in the upper hard mask.

1 8. The process according to claim 1, wherein forming a first ILD layer includes:
2 forming an inorganic first bottom ILD layer; and
3 forming an organic first top ILD layer.

1 9. The process according to claim 8, wherein forming a first recess includes:
2 forming a dual-damascene recess in the inorganic first bottom ILD layer and in
3 the organic first top ILD layer.

1 10. The process according to claim 9, further including:
2 forming a first hard mask above and on the organic first top ILD layer; and
3 patterning an opening in the first hard mask.

1 11. The process according to claim 8, wherein forming an upper ILD layer includes:
2 forming an inorganic upper bottom ILD layer; and
3 forming an organic upper top ILD layer, and wherein forming an upper recess
4 includes forming a dual-damascene recess in the inorganic upper bottom ILD layer and in
5 the organic upper top ILD layer.

1 12. The process according to claim 11, further including:
2 forming an upper hard mask above and on the upper bottom ILD layer; and

3 patterning an opening in the upper hard mask.

1 13. The process according to claim 1, wherein forming a first ILD layer includes:
2 forming an organic first bottom ILD layer; and
3 forming an inorganic first top ILD layer.

1 14. The process according to claim 13, wherein forming a first recess includes:
2 forming a dual-damascene recess in the organic first bottom ILD layer and in the
3 inorganic first top ILD layer.

1 15. The process according to claim 14, further including:
2 forming a first hard mask above and on the organic first bottom ILD layer; and
3 patterning an opening in the first hard mask.

1 16. The process according to claim 13, wherein forming an upper ILD layer includes:
2 forming an organic upper bottom ILD layer; and
3 forming an inorganic upper top ILD layer, and wherein forming an upper recess
4 includes forming a dual -damascene recess in the organic upper bottom ILD layer and in
5 the inorganic upper top ILD layer.

1 17. The process according to claim 16, further including:
2 forming an upper hard mask above and on the upper bottom ILD layer; and
3 patterning an opening in the upper hard mask.